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Evaluation of Nuvan Toxicity Stress on Blood Lipoprotein of Fresh Water Fish *Channa punctatus*

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Abstract

Organophosphate insecticide Nuvan (DDVP) has selected for the present study, Lethal concentrations were calculated for the fresh water snake headed fish *Channa punctatus* i.e 0.27ml/L after 24, 48, 72 and 96 hours. For the chronic study 1/10th of the Nuvan concentration (0.027ml/L) was provided to the observed fishes. Blood serum lipoprotein HDL, VLDL and LDL High Density lipoprotein, Very low Density lipoprotein and low density lipoprotein respectively were estimated after chronic toxic stress of Nuvan to fish *Channa punctatus.* Fish serum lipoprotein and HDL revealed significant decrease level while LDL and VLDL showed significant elevated level after 7, 14, 21, and 28 days at different level p <0.01 and p <0.001.All values are mentioned in graphs respectively.

Keywords: Blood lipoprotein , freshwaterfish, organophosphate

Introduction

Water is an element in determining the quality of environment and the overall social and economic development possibilities of any region. Fresh water is highly vulnerable to pollution since it acts as immediate sink for the consequences of human activity and always associated with the danger of accidental discharges or criminal negligence. Contaminated water is a threat for aquatic organisms including fish but is also responsible for transmitting a wide variety of disease in humans. Aquatic toxicologists use physiological dysfunction in fishes to assess the quality of water. Test compound Nuvan is a synthetically produced OP (Organophosphate) insecticide, quick knock down effect on chewing and sucking type of insects and act both contact and stomach poison, highly toxic, available in form of aerosol and soluble concentration, used to control house hold, public health and stored product insects. It is effective on mites, caterpillars, thrips, white flies; treat a variety of parasitic worms, infection in dogs, live stocks and humans.The present study elaborated LC_{50} calculation, changes in fish serum lipoprotein (HDL, LDL and VLDL) under sub lethal stress of Nuvan at different time interval.

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Materials and Method

Healthy live fresh water snake headed fish *Channa punctatus* weighing 50 to 70 gms and 12-14 cms in length were collected from local fresh water pond Malpura at Agra district (U.P.). Fishes were kept in large glass aquarium (75×37.5×37.5 cm) capacity 25 litre non chlorinated tap water, which was stored for one week before experiment. Aquaria bathed 1% $Kmno_4$ solution to avoid any kind of dermal infection. Fishes were acclimatized seven days prior to experiment at temp. ± 20-25°C with 7.2 pH. During experimentation commercial marketed food or egg yolk was provided to fish twice in a day 10.30 and at 4.30 pm. Feeding was stopped 24 hours before starting the experiment. Dead fish (if any) were removed from aquaria as soon as possible to avoid water fouling, water was changed after 2 or 3 days. Nuvan "Dichlorvos"(DDVP) was purchased from local Chipitola market at Agra manufactured by Syngenta India Ltd.. Experiment was divided into two parts, (i). For LC_{50} determination and (ii). For biochemical estimation

For LC_{50} determination five aquaria were setup, four treated with different concentrations (0.1, 0.2, 0.4 & 0.8 ml) and one control group of healthy fish maintained simultaneously. In each aquaria, six

fishes were taken in 25 litre dechlorinated tap water. After 24, 48, 72 & 96 hours survival and mortal number of fishes were observed and calculated mortality percentage and drew mortality percentage graph were drawn. With the help of standard table and regression line analysis calculated LC_{50} value (Table I a nd Fig. 1). The data was analyzed statistically by log dose/probit regression line method (Finney, 1971). For chronic study sub lethal concentration of Nuvan 1/10 th was applied to fish. At the end of each experimental duration 7, 14, 21 and 28 days, fish sacrificed simply by a little struck on fish head by the help of hand and after the autopsy, blood directly collected from heart chamber with the help of scissor, forceps and sterilized disposable syringe. Blood collected in centrifuge tube, kept for 30 minutes in saliently position then centrifuged for 30 minutes at 3000 rpm and after two hours supernatant was carefully separated in glass vials with help of rubber bulb pipette. Fish blood serum High Density Lipoprotein (HDL) estimated by Warnick *et al*. (1985) method.Very Low Density Lipoprotein (VLDL) was estimated by Friedwald *et al*. (1972) method and Low Density Lipoprotein (LDL) is calculated value means a fter calculating of Cholesterol,VLDL and HDL we can find LDL value by this formula CHO –(VLDL+HDL). Data was analysed statistically by student't' test, Fischer and Yates (1950).

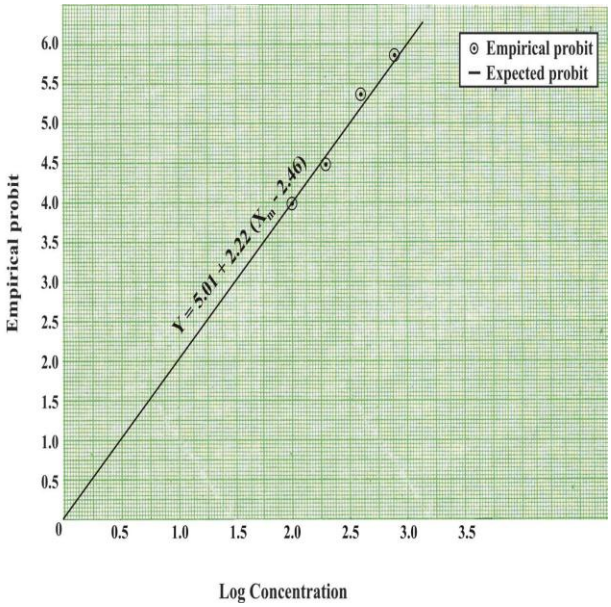


Fig. 1 : LC_{50} determination.

Experimental Animal	Compound	Regression equation	LC_{50}	Variance	Fiducial limits
Channa punctatus	Nuvan (DDVP)	Y = 5.01 + 2.22 (X_m – 2.46)	0.27 ml/L	0.042	m_1 (+) = 2.53 m_2 (-) = 2.41

Table 1 - Toxicity evaluation of Nuvan to *Channa punctatus* specifying fiducial

Results and Discussion

The present investigation has been made on the blood biochemistry to fresh water snake headed fish *Channa punctatus* (Bloch) under organophosphate sublethal dose of (0.027 ml/L) Nuvan at chronic toxicity for the duration of 7, 14, 21 and 28 days and compared with control set. Present findings observed highly significant at various p values to serum biochemistry. Results revealed a highly toxic disturbance by the toxic stress with increasing time of exposure to fish *Channa punctatus* to following parameters- Lipoprotein estimated then HDL level revealed decreasing trend while VLDL and LDL reported highly significant elevation in blood serum of *Channa punctatus* in study (Table 2, 3, 4 and Fig. 2,3,4). Decreasing level of HDL might be possible due to chronic kidney disease (CKD) and ischemic damage to the myocardium due to interfere of Nuvan. After the Nuvan intoxication VLDL level significantly increased, it could be possible damage of liver cells and damage of heart because large concentration of VLDL continuously converting into LDL in stress condition. LDL level also reported increasing values in blood serum of *Channa punctatus* under toxic stress of Nuvan. LDL elevation might be possible due to toxicant interference in LDL mechanisms. It damages to peripheral cell and its receptor because peripheral cell also play a role in blood as LDL receptor which

recognize by apo B – 100 apolipoprotein. Protein synthesis also disrupt due to toxicant so the receptor is not properly functioned, resulting elevation in blood serum LDL which highly dangerous to heart as atherosclerosis.Our finding gain support by a few workers who have observed fish lipoprotein under toxic stress. Wolinsky (1980) suggested LDL and HDL levels are associated negatively and positively to arthrosclerosis. LDL and HDL ratio estimated risk factor for closely related to the myocardial injury. Whayne *et al.* (1981) suggested that VLDL and LDL significantly greater that indicate coronary artery disease. Katz and Messineo (1981) and Bajaj (1984) resulted lipid abnormalities in producing most of the clinical manifestations of ischemic damage to the myocardium. Bhatti *et al*. (1985) reported a inverse relationship between HDL and LDL levels suggested that the two lipoprotein classes are tried to a common enzyme possible lipoprotein enzyme. Bhatti *et al.* (1985) also observed HDL levels were not much altered while the percentage value of the

Table 2 - High Density Lipoprotein (HDL) (mg/dl) in blood serum of *Channa punctatus* after Nuvan toxicity

HDL (mg/dl)	Control	Exposure Time				Result
		7 days	14 days	21 days	28 days	
Range	70 – 75	64 – 70	60 – 67	50 – 59	42 – 49	Decreased
Mean	72.5	67.3	63.0	54.6	46.0	
± S.Em.	0.637	0.969**	0.894***	0.905***	0.846***	
t value		3.79	7.53	13.93	21.90	

± S.Em – Standard error of mean
**** – Highly significant (p<0.01)**
***** – Very highly significant (p < 0.001)**

Table 3 - Very Low Density Lipoproteim (VLDL) (mg/dl) in blood serum of *Channa punctatus* after Nuvan toxicity

VLDL (mg/dl)	Control	Exposure Time				Result
		7 days	14 days	21 days	28 days	
Range	32.12 – 37.07	36.0 – 42.0	39.0 – 46.0	48.0 – 54.0	51.0 – 59.0	Increased
Mean	34.8	38.7	42.7	52.5	55.2	
± S.Em.	0.502	0.511**	0.614***	0.945***	0.779***	
t value		5.37	9.03	13.2	18.54	

± S.Em. – Standard error of mean
**** – Highly significant (p<0.01)**
***** – Very highly significant (p< 0.001)**

Table – 4 Low Density Lipoprotein (LDL) (mg/dl) in blood serum of *Channa punctatus* after Nuvan toxicity

LDL (mg/dl)	Control	Exposure Time				Result
		7 days	14 days	21 days	28 days	
Range	120.53 – 126.10	131.36 – 136.20	138.27 – 144.77	150.21 – 157.18	156.21 – 160.32	Increased
Mean	123.5	133.7	141.2	153.67	158.1	
± S.Em.	1.19	1.40**	1.09***	1.25***	0.957***	
t value		5.12	11.49	17.04	25.62	

± S.Em. – Standard error of mean
**** – Highly significant (p<0.01)**
***** – Very highly significant (p< 0.001)**

Fig. 2 : Effect of Nuvan toxicity on serum High Density Lipoprotein in *Channa punctatus* (Bloch.)

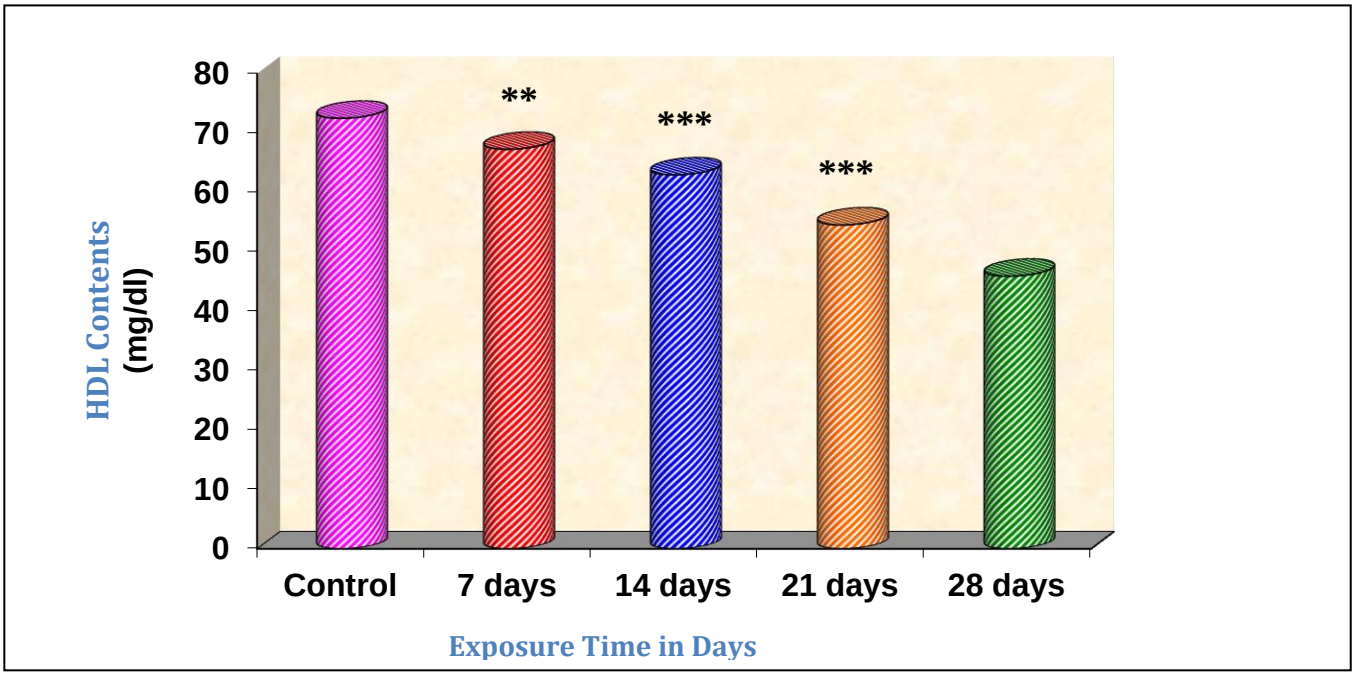


Fig. 3 : Effect of Nuvan toxicity on serum Very Low Density Lipopsrotein in *Channa punctatus* (Bloch.)

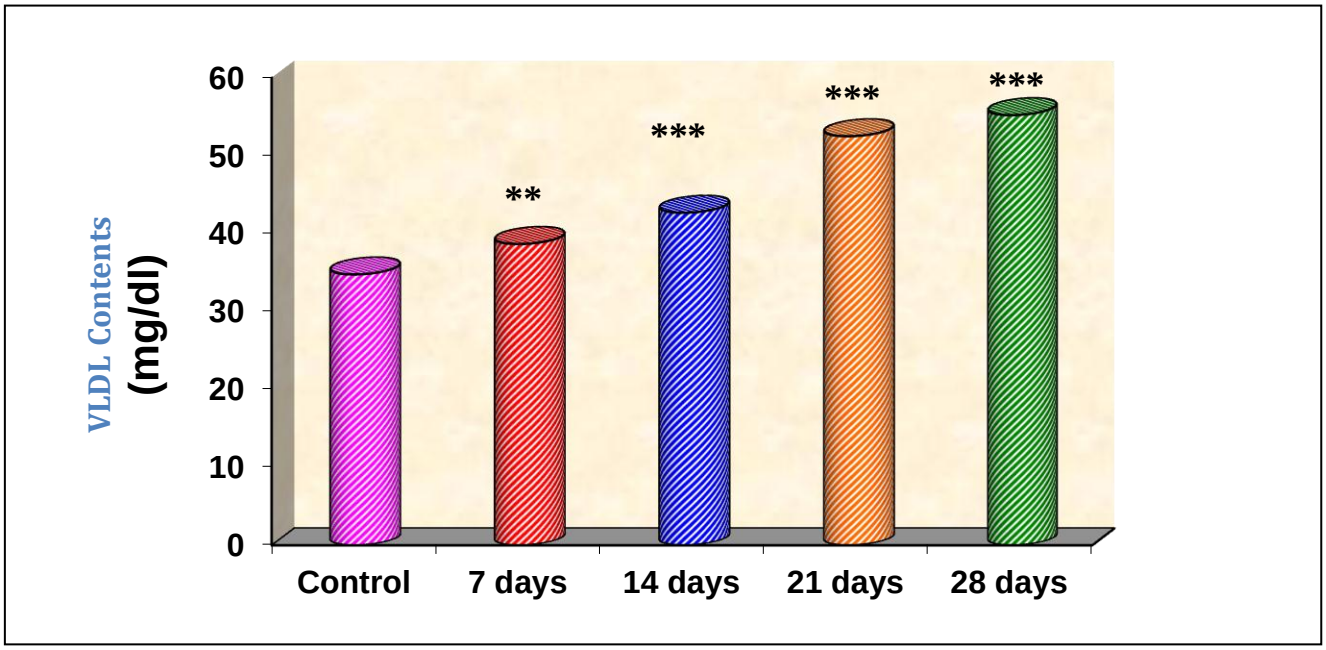
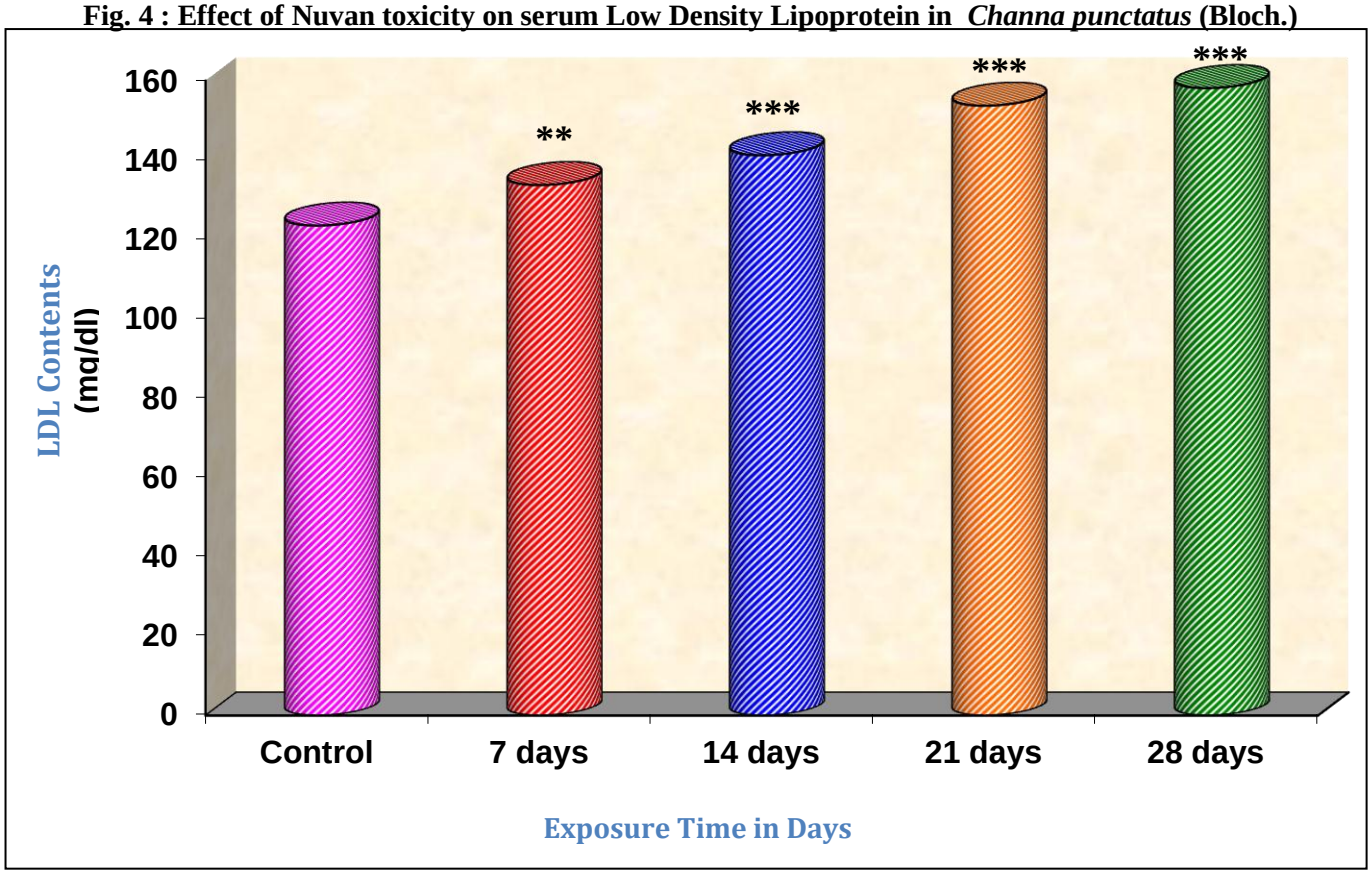


Fig. 4 : Effect of Nuvan toxicity on serum Low Density Lipoprotein in *Channa punctatus* (Bloch.)



circulating VLDL increased. Boizel *et al.* (2000) reported typical dyes lipoproteinemia of type 2 diabetes in case of when VLDL, LDL increased and decreased HDL level. Same finding observed by Taskinen (1992). Das and Bhattacharya (2002) observed blood and hepatic cholesterol HDL, VLDL and LDL inhibited throughout the experimental period under stress in *Channa punctatus*. Jung *et al.* (2003) observed no significant changes in HDL of *Paralichthys.* Yousef *et al* (2003). reported decreased in HDL and significant increment in VLDL and LDL level under cypermethrin stress. Celik *et al.* (2004) reported range of HDL, LDL and VLDL in black scorpion fish and suggested lipoprotein synthesized in the liver seemed to be associated with the storage sites of lipid in fish and other hydrophobic compounds. Varizi *et.al.* (1999) reported decrease in HDL due to CKD (Coronary Kidney Disease).

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